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ABSTRACT

The evidence presented in this paper suggests that deficits in selective skills are primary factors in learning disabilities, and that aptitude/treatment interaction models may be useful in devising teaching methods for the reading instruction of learning disabled children. After reviewing various approaches to teaching reading to learning disabled children, a new approach is proposed that combines task-analytic programing, applied behavioral analysis, and selective attention to certain skills. Task analysis discloses the fact that certain skills must be taught, most often correct phoneme responses to graphemes, responding in correct sequences, and blending separate sound units into one word; task analysis also reveals, however, that not all skills commonly included in conventional teaching programs are essential to problem learners. The paper concludes that more than ever and especially for the learning disabled, teachers need to carefully match the type of instruction to the needs of the individual learner. (Discussion following presentation of the paper is included.) (RL)

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Teaching Reading to Learning Disabled Children: A Fourth Approach

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TEACHING READING TO LEARNING DISABLED CHILDREN

The current organized learning disability movement, replete with journals, conventions, and parent groups began in the early 1960s. Three distinguishable types of approaches to teaching learning disabled (LD) children have emerged -- the etiological, the diagnostic-remedial, and the task-analytic (Bateman, 1967b).

The contributions and limitations of each of the three approaches for teaching reading to learning disabled children are reviewed briefly and a fourth approach is proposed. The fourth approach suggests that many learning disabled children have certain characteristics which require very precise and careful teaching of decoding if they are to achieve mastery of initial reading skills. This fourth approach combines task-analytic programming of reading instruction (e.g. Engelmann and Bruner, 1974; Venezky, Note 1) with research on the learning processes of learning disabled children (Hallahan and Kauffman, 1976; Ross, 1976) and proposes that aptitude-treatment interaction is a viable premise on which to rest the combination (Salomon, 1972; Tobias, 1976).

Learning Disabilities and Reading Disabilities

Current texts in learning disabilities necessarily recite two litanies -- the phenomenal growth of the field and the fact this growth has occurred without an accepted definition of learning disabilities (see Hallahan & Kauffman, 1976; Lerner, 1976; Ross, 1976). Some authors cite several of the more widely known definitions and let the matter rest; others add yet another definition; most point out the circularity and logical inconsistencies implicit in the available definitions.

A major unsettled definitional issue is the role, if any, of central nervous system (CNS) dysfunction in learning problems. Positions range from acceptance

of demonstrated CNS dysfunction as a sine qua non of learning disabilities (Clements, 1966) to its complete rejection as irrelevant (Cohen, 1973).

Another unresolved debate centers on the use of a "discrepancy" requirement. Some definitions stipulate a significant discrepancy between cognitive potential and actual performance. The discrepancy concept is, predictably, challenged by those who argue there is no valid or appropriate way to assess cognitive potential. Strongest support comes from those who would clearly distinguish learning disabilities from mental retardation.

A third difference among definitions centers on etiological exclusions. Many argue that learning disabilities may not be caused primarily by mental retardation or sensory deficits. Some also exclude those children whose learning problems are judged due to severe emotional problems, cultural differences, and inadequate instruction. Congress currently uses the definition formulated by the National Advisory Committee on Handicapped Children (1968):

> Children with special learning disabilities exhibit a disorder in one or more of the basic psychological processes involved in understanding or in using spoken or written language. These may be manifested in disorders of listening, thinking, talking, reading, writing, spelling, or arithmetic. They include conditions which have been referred to as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia, developmental aphasia, etc. They do not include learning problems which are due primarily to visual, hearing, or motor handicaps, to mental retardation, emotional disturbance or to environmental deprivation. (p.4)

A committee of the Association for Children with Learning Disabilities

recently recommended amending this definition to include children with specific learning disabilities who also have sensory, motor, intellectual, or emotional problems or who are environmentally disadvantaged (Kirk, 1974).

Another dispute is over whether learning disability necessarily implies a deficiency in academic performance. Few definitions specifically state that it does; yet it is hard to imagine many children are or should be regarded as learning disabled when school performance is satisfactory.

Professionals remain unable to agree on a definition, but in practice the overwhelming majority of children labelled learning disabled are having difficulty in reading beyond what would be predicted by experienced teachers taking into account such factors as apparent intelligence, home background, and so on. Many also have writing and spelling problems; some are perceived as hyperactive; some as poorly coordinated; some as having receptive and/or expressive difficulty with spoken language; a few show finger agnosia, etc. The list of possible accompanying difficulties is nearly endless. Arguably a few children who have learned to read with no more than the usual difficulty may have been labelled learning disabled. If so, they are not within the scope of the present discussion, as it is clear that teaching them to read is not different from teaching any other children.

Learning Disabilities versus Remedial Reading

The question of how, if at all, children with learning disabilities differ from those with reading disabilities is currently being debated (Artley, 1975; Chall, Note 2; Lerner, 1975). A disinterested observer might be moved to consider the concept of territorial imperative. Differences are cited and disputed as to teacher training, terminology, views on etiology, and focus of remediation. As yet, the classroom teacher has few, if any, guidelines as to whether Janie,

struggling inordinately with learning to read, should be sent to the learning disability or remedial reading teacher. (In fact, evidence is far from clear that either can be counted upon to teach Janie to read, but that is not the issue.) Whatever differences may or may not exist between the philosophy and practices of the two disciplines it seems clear that both are concerned with the same children -- those children who are failing to learn reading as readily as it seems they should. The label "learning disabled" would not, in all circles, be as readily applied to the children with very mild reading problems as would "remedial" or "corrective reader." With this one minor exception the terms learning disabled and reading disabled apply to the same children and are so used here.

One further preliminary observation is vital. As indicted earlier, many would exclude from the category of learning disabled those children who have not had adequate reading instruction. The assumption of adequate instruction is probably false when it is made regarding conventional whole word, meaning-emphasis instruction (Otto, 1972; Samuels, 1970). The inadequacy of much current reading instruction is becoming so clear that fewer and fewer are heard to claim it is but an illusion caused by compulsory attendance or television or the breakdown of the family. A growing number of educators and special educators now hold that a child's failure to learn to read is per se clear and convincing evidence that the instruction was inadequate (e.g., Cohen, 1973; Engelmann, 1969b, 1967b). A related position is that even if, at some level of reality, there might be different or additional etiological factors, the educator is nonetheless professionally bound to conceptualize the problem as an instructional one since only instructional variables are under educators' control (e.g., Bateman, 1973; Otto, 1972).

Once it has been determined who the child is who is having difficulty learning to read the next step is to diagnose the problem and plan intervention. Three approaches have been taken to the diagnostic-remedial process (Bateman, 1967 b) and each is discussed briefly in the following sections:

Etiological Approach

The only sure way to prevent a child from learning to read is to preclude all opportunity to make the appropriate associations between written letters and the sounds they represent. Therefore the only certain cause of reading failure is the absence of incidental or systematic instruction. For every other alleged cause of reading disability children can be found who put the lie to the theory. Some brain injured children read, as do children with malnutrition, disinterested parents, abnormal EEGs, inadequate lateralization, poor vision, chromosomal abberations, older sisters who achieve well in school, speech defects, finger agnosia, undescended testicles, hyperactivity, left-handedness, thyroid deficiences, double hair sworls, low IQs, unresolved oedipal conflicts, jagged ITPA profiles, and every other alleged etiological factor. In light of this, those who use the term "correlates" are on safer ground than those who search for "causes." But perhaps neither is on the most direct route to solving the educational problem (which is not to say there aren't other problems also well worth addressing). In one of the most powerful explications of educators' treatment of cuases of school failure Engelmann (1969b) describes how we have sought general rather than specific causes and have failed to concentrate on asking what precisely is it about reading the child has not been taught. Some formulations of alleged causes of reading failure have educational implications; others do not. Perhaps some that do not, at the present time, will in years to come. We do not here dispute the "truth" of any alleged

causes; we do urge that educators and program developers examine the utility, for their purposes, of etiological formulations.

A few etiological theories purportedly do lead to teaching strategies. Delacato (1966), e.g., includes activities designed to establish hemispheric dominance in his program for teaching reading. Other theories do not purport to have such implications. No one argues, e.g., that correlational data on family income and reading achievement should prompt reading teachers to give dollars to parents of children in the lowest reading group. A large number of alleged etiologies arguably suggest treatment designed to make children more amenable to instruction, e.g., correcting visual refractive errors, prescribing ritalin, or using broad spectrum lighting to replace narrow spectrum artificial light. But none of these replaces reading instruction. Numerous reviews of the etiology of reading disorders are available (e.g., Bannatyne, 1966; Blom & Jones, 1971; Westman, Arthur, & Scheidler, 1965).

The relevance-to-teaching position on etiology, espoused here, is treated at greater length by Bateman (1973), Cohen (1973), Engelmann (1969b, 1967a) and Otto (1972). They, and others, assert that the etiological classifications most useful to educators are those which specify precisely what the child needs to be taught about reading, e.g., short vowel sounds, left to right decoding or sound blending. Opponents object that merely knowing a child responds to b by saying /d/ (and vice versa) about half the time is not sufficient diagnostic information when some children may do so "because" of brain injury, others "because" of inadequate binocular fusion, others "because" of poor motivation, etc. This objection is premised on the belief that letter discrimination (or phoneme-grapheme correspondence) can or should be taught differently to children who, for different reasons, have not yet learned it. It is this contention that

forms the basis of the position that teaching reading to learning disabled children is different from teaching reading to other children. And it is this position which is critically examined in the remainder of this discussion. The source of severe reading disability, excluding original etiological possibilities, may be viewed as inhering in the child, in the instruction, or in a mismatch between child and instruction. Each of these conceptualizations and the instructional techniques deriving from them will be examined and evaluated.

The Diagnostic-Remedial Approach

Several process models, clearly diagnostic-remedial in nature, are presented. Ross' (1976) learning model, also discussed, is perhaps a hybrid of diagnostic-remedial and task-analytic models.

Process Models

The view that the child has correlated deficiencies which must be remediated has been the majority position within the field of learning disabilities as it has existed and developed over the past twenty or thirty years. This conceptualization has been known as the diagnostic-remedial approach (Bateman, 1967b), prescriptive-teaching (Peter, 1965), ability and process training (Kesseldyke & Salvia, 1974) psychometric phrenology (Mann, 1971), and even task analysis (Johnson, 1967). Typically the child's cognitive, perceptual, sensory-motor and other processes are assessed by a variety of psycho-educational instruments and patterns of strong and weak functioning ascertained. Often an effort is made to determine which among the deficits observed is "primary." The observed deficits on psycho-educational instruments are said to be merely correlated with the academic deficiency and causality is specifically disavowed (Kirk, 1972). It is however, interesting to note that, nevertheless, remediation is planned to overcome or circumvent the correlated deficit with the implicit,

If not explicit, hope that so doing will either alleviate the academic problem or lay a foundation for so doing. This procedure suggests the belief may still be closer to causality than to mere correlation.

Visual Perceptual, visual, and visual-motor perceptual training. Few topics within learning disabilities have been as extensively researched as has the Frostig visual perception training program. Comprehensive reviews of the research (e.g., Robinson, 1972a; Wiederholt and Hammill, 1971) reveal that the Frostig training program does tend to increase scores on the Frostig Developmental Tests of Visual Perception, sometimes increases reading readiness scores, and does not improve reading. Illustrative studies finding no relationship between visual-perceptual training and reading are those by Anderson (1972) and Jacobs (1968). Larsen and Hammill's (1975) most recent review concludes research does not support a necessary relationship between reading and visual-motor integration, spatial relations, visual memory, or visual discrimination, as measured by current instruments. One perceptual test commonly used which appears to differentiate reading or learning disabled children from normal readers is the Bender Gestalt (see e.g., Keogh, 1965; Larsen, Rogers & Sowell, 1976) but that statistical differentiation holds only for groups of children and is of dubious predictive or educational value. Koppitz (1975) found the Bender distinguished control children from learning disabled children, but did not differentiate between those learning disabled children who did and did not have reading problems.

A few young children do have difficulty learning to name (or give the sound for) letters of the alphabet. Undoubtedly this fact contributes to the popularity of the view that visual discrimination or perceptual training must be needed. But these same children can visually identify hundreds of other objects or events

and as Rozin, Poritsky, and Stotsky (1971) and Harrigan (1976) have demonstrated even young children with severe reading problems can learn as many as 30 Chinese characters in a few hours. This task clearly requires as much or more visual discrimination or perception than learning English letters. Very young children can usually perceive and discriminate letters (Calfee, Chapman, & Venezky, 1972), so the source of difficulty in naming (or sounding) must be sought elsewhere.

Krippner (1973) and Keogh (1974), in two eminently readable reviews, have examined the controversy surrounding optometric visual and visual-perceptual training. Both conclude the controversy is unresolved and will continue at least until better research is available. As to the relationship between visual-perceptual ability and reading, Keogh astutely observes that good visual-perceptual ability may be an outcome of good reading -- "that is, as a child learns to read, he develops adequate visual perceptual organization, he masters scanning in a horizontal left-right direction. . . " (p. 227).

Kephart's (1960) motor-perceptual remediation was evaluated in a review of more than 30 studies by Kiesius (1972), who found that of 11 studies meeting his criteria for acceptability more than half did not favor Kephart's procedures.

Hammill, Goodman and Wiederholt (1974) reviewed 76 studies of the Frostig and Kephart programs and concluded that visual and motor perceptual training programs have not demonstrated an effect on academic achievement and that we must question the assumption that perceptual-motor inadequacy causes reading problems. It should be noted that the Frostig and Kephart programs do not utilize verbal symbols. Delacato's (1966) training method utilizes motor activities such as creeping and patterning to develop hemispheric dominance and thus improve reading ability. Independent studies by Anderson (Note 3), Robbins (1966), and O'Donnell (1969) failed to find clear support for the still controversial techniques.

Balow (1971) reports that after numerous searches of the literature he found no scientifically acceptable data which demonstrated special effectiveness for any of the physical, motor, or perceptual programs used in the prevention or correction of reading or other learning disabilities.

Auditory perceptual training. Sabatino (1973) has extensively reviewed the development and assessment of auditory perception and intervention efforts, noting that in comparison to visual perception, relatively little information is available. He concludes that research has established a correlational relationship between reading failure and auditory functioning and observes there is general disagreement as to whether auditory perceptual functioning (e.g., Johnson & Myklebust, 1967) or by weaknesses (e.g., Silver & Hagin, 1967b) or is ever indicated at all (Mann, 1970). No studies were reported which clearly demonstrated auditory perceptual training has a direct effect on reading achievement. Hammill and Larsen's (1974) review found little support in the research literature for the assertions that auditory discrimination, auditory memory, sound blending, or auditory-visual integration as measured are essential to reading. Since three or four year olds can accurately repeat words and patterns of sounds, and even infants can differentiate similar syllables (Elmas, Siqueland, Jusczyk, & Vigorito, 1971) we must agree with Rozin and Gleitman's (in press) conclusion that pre-literate children have adequate auditory perceptual development for acquiring reading skills and that except in very rare cases, auditory perceptual training is not important to teaching reading except as teaching reading per se is a form of such training.

Auditory-visual integration. Deficient integration in the sensory systems was proposed by Birch (1962) as causing or related to reading disability and h

been supported by research (e.g., Birch & Belmont, 1966; Lovell & Gorton, 1968; Zurif & Carson, 1970). However, an arguably better view is that the revealed auditory-visual matching deficiencies are due to verbal labeling problems rather than to cross-model transfer problems (Blank & Bridger, 1966; Blank, Weider, & Bridger, 1968; McGrady & Olson, 1970; Steger, Vellutino, & Meshoulam, 1972; Vellutino, Steger, & Kandel, 1972; contra Drader, 1975). Direct teaching of grapheme-phoneme correspondence is one visual-auditory integrative activity clearly supportable at the present time since it is per se part of the reading act.

Psycholinguistic training. The Illinois Test of Psycholinguistic Abilities (ITPA) has been extensively used to diagnose and plan remediation for children with reading problems. Apart from possible weaknesses in the theoretical underpinnings of this process approach, severe criticism has been directed at the test's reliability, validity and factorial structure (e.g., Ysseldyke & Salvia, 1974; Ysseldyke, 1973; but see Newcomer, Hare, Hammill, & McGettigan, 1975) and it has been suggested that remedial activities may not be justified (Hammill & Larsen, 1974; Harris, 1976). Carroll (1972) suggests that there may not be a pattern of scores on the ITPA characteristic of poor readers. However, a review of early evidence on the 1961 experimental ITPA (Bateman, 1965) showed that poor readers were consistently low in auditory and/or visual sequential memory. Both of these tests are at the non-meaningful, automatic-sequential level of language usage. Poor readers were significantly superior to good readers in visual decoding at the semantic or representational level of language usage (Kass, 1966). These findings suggest, consistent with Rozin and Gleitman's (in press) analysis, that poor readers have difficulty with accessing surface and not with accessing meaning.

Summary. Ability or process training has come under severe and growing criticism. Bannatyne (1975) has, however, expressed important cautions in uncritically accepting the negative reviews and conclusions as to possible relationships between these abilities and academic achievement.

Ysseldyke and Salvia (1974) have contrasted ability training to task-analytically derived skills training (discussion infra) and fault the former for (a) using hypothetical constructs which go beyond observed behaviors and inferring they are causes of the observed differences; (b) hypothesizing that processes or abilities are essential prerequisites to skills achievement when data (e.g., Abt Associates, 1976; Bijou, 1970; Cohen, 1969; Haring & Bateman, in press) show that the skills can be taught directly and when only correlational (not causal) data suggest a relationship between process and skill (c) using diagnostic test instruments of questionable reliability and validity and (d) assuming aptitude treatment interactions which have not been shown to exist. Vellutino (Note4) has levelled essentially similar criticism specifically at the reading disability field and concludes: (a) There is little support for the theory (or its derivative practices) which views reading disability as caused by visual-spatial confusion stemming from neurological disorders; (b) Findings supporting the deficient sensory integration hypothesis are equivocal at best; (c) Much more support is available for the hypothesis that reading disability is associated with verbal learning deficiencies. He contends that even so, remedial activity in verbal skills should be directed toward specific aspects of the reading act itself.

At least two essential premises in the diagnostic-remedial approach remain unsupported: (a) The assumed deficiencies in psychological processes can be reliably and validly assessed; (b) Remediation of these processes will

result in improved academic performance. And yet, programs based squarely on these premises continue to flourish and to dominate the field among practitioners, if not among academicians and researchers. Harris (1976) suggests this is the situation becuase research has not had sufficient impact to overcome the three forces he sees as controlling -- the "bandwagon," the "pendelum" and the Zeitgeist effects. Ultimately, the tide will be turned by the ready availabilty of more successful approaches. Some are already here.

Attention Deficits

Two recent texts (Hallahan & Kauffman, 1976; Ross, 1976) may signal the beginning of a more date-based approach to teaching learning disabled children. Both reflect movement away from the questionable premises and instrumentation of the diagnostic-remedial approach, and both highlight the probable role of attention deficits in the academic difficulties of the learning disabled child. Ross however distinguishes attention deficits from hyperactivity and distractibility while Hallahan and Kauffman do not. (See Hewett, 1974, for related views.)

The prominent role of attention in perceptual and cognitive development has been recognized and studied by many (e.g., Bandura, 1969; Gibson, 1969; Zeaman & House, 1963), as has its role in the acquisition of reading skills (e.g., Staats, 1968a,b; Staats, Brewer, & Gross, 1970). Ross (1976) and Hallahan and Kauffman (1976) specifically apply such theoretical and research contributions on attention and reading to the learning disabled child.

Ross. Ross' (1976) review and analysis of research on learning and learning disabilities led him to conclude that learning disabled children have a developmental delay in sustaining selective attention. This conclusion is not inconsistent with observations of others (e.g., Senf, 1972; Chalfant &

Flathouse, 1971); but never has it been more systematically and carefully derived and applied to teaching learning disabled children. While a developmental delay in selective attention is, conceptually, a deficit within the child, Ross' formulation has been derived from a task analysis of learning and is applied to a simplified hierarchy of reading skills (selective attention --> sequential scanning --> discrimination --> decoding --> comprehension) in an effort to extract instructional implications for teaching reading. Ross holds that the capacity to inhibit stimuli irrelevant to the task at hand and to selectively focus attention on relevant stimuli develops through interactions of maturation and learning and that many learning disabled children (enough to justify so defining learning disabilities) suffer a delay in its development. He argues convincingly that frequently reported distractibility, hyperactivity, and perceptual-motor integration defects may be but aspects of the selective attention problem. Several techniques for direct teaching of selective attention in reading are presented. One tactic is to exaggerate the differences between stimuli to be discriminated, making the critical patterns more obvious. Hyman and Cohen (1975) have independently shown the effectiveness of fading the vertical line on b and d to successfully achieve that result. The DISTAR reading program (Engelmann & Bruner, 1974) utilizes different type styles for b and d for the same purpose. (See also Caron, 1968; Koenigsbery, 1973.) The evidence is clear that most so-called reversal problems can be prevented by careful teaching and programming, a fact further supporting the contention that learning disabled children do not suffer from visual perceptual problems. Several reading methods commonly recommended for learning disabled children utilize a sensory-motor component (e.g., Fernald, 1943; Gillingham & Stillman, 1966). Ross suggests the sensory-motor element may merely serve to focus attention on the all-important

shape of the letter being taught, and per se add anything else. Clear empirical evidence supporting the efficacy of sensory-motor reading techniques with learning disabled children is scant, but clinical testimony and case studies attest to their continuing popularity and perceived utility. Another technique Ross recommends is presenting the relevant stimulus dimension in a variety of forms. Size, color, brightness, and texture of letters can all be varied while the critical features of shape and position in space remain constant. Such variations also capitalize on the fact that novelty, to a point, enhances attention.

Ross also urges that children who have failed in reading and to whom letters and words have become aversive may also need systematic extrinsic reinforcement to once again attend to the appropriate stimuli. (See, e.g., Engelmann, Becker, Carnine, Meyers, Becker, & Johnson, 1975; Heiman, Fischer & Ross, 1973; Staats & Butterfield, 1965).

While Ross thoroughly discusses learning disabilities and the teaching of other aspects of reading (sequential scanning, etc.) his unique emphasis is on selective attention. He shares the views, discussed elsewhere, that even young children can be taught to consistently decode in a left-right direction and believes that neither discrimination nor paired-associate learning deficits have been shown to be causally related to reading disorders. He suggests selective attention deficits could underlie both.

Hallahan and Kauffman. Hallahan and Kauffman (1976) stop short of holding that attention deficits are so central as to be a proper part of the definition of learning disabilities; but they do find the evidence clearly supports the existence of selective attention deficits in many learning disabled children (see Hallahan, Kauffman, & Ball, 1973; Hallahan, 1975, and a review by Tarver

& Hallahan, 1974). They do not find research supports the frequently advocated reduction of environmental stimuli as an aid to academic achievement. They do however, recommend the use of color cues to draw attention to the critical features essential to better discriminations and the use of verbal rehearsal and specific instructions as to what should be attended to. The majority of their recommendations fall under the rubric of applied behavioral analysis, to be discussed infra.

Task Analysis

In introducing applied behavior analysis Hallahan and Kauffman (1976) describe it as even more oriented than are diagnostic-remedial approaches to "the specification and analysis of molecular units of behavior that are important for learning in school. Those who espouse a behavior modification approach are among the strongest proponents of behavioral assessment or analysis. Interested in the teaching of specific skills to children with specific learning problems, the advocates of behavior modification or applied behavior analysis seek to improve specific behaviors and to determine precisely the teaching procedures that are responsible for the improvement" (p. 57). They further observe that applied behavior analysis is particularly useful with learning disabled (and emotionally disturbed and mentally retarded) children because it allows precise measurement, is based on empirical data from the child's own performance, suggests specific remedial methods, facilitates individualization of instruction, and provides continuous evaluation of teaching procedures.

Applied behavior analysis does not prescribe what specific skills are to be taught, but can determine the efficiency of any set of skills in reaching an objective. The term task analysis is used here to mean the process of determining what specific subskills must be taught. While there is no necessary

implication that educators who use task analysis will also use applied behavioral analysis, the majority do. Applied behavioral analysis is outside the scope of this discussion except to note (as will be discussed later) that learning disabled children suffer more than most when it is not employed in teaching.

Careful analysis of the act of reading itself, beyond description of possible errors children make, has not previously been of major concern to the traditionalist view of reading and learning disabilities. It is as if the basic assumption that children who read poorly must themselves be deficient has precluded serious consideration of the possibility that in reality the reading instruction was inadequate. The fact that the majority (a decreasing one in recent years) of children have learned to read has apparently been accepted as satisfactory evidence the teaching was appropriate to the nature of the task. Engelmann (1967b) has aptly observed that if a child learns to read the program is credited, but if she fails the child is faulted.

Many factors have had a part in the emergence of reading and learning disability specialists' interest in an analysis of the reading task. In the field of reading itself there has been the growing awareness that children have been reading less and less well in recent decades (Matthews, 1966; Lerner, 1976) and that the method of teaching does indeed make a differnece. No longer does the fact of wide intra-program differences obscure the fact of important inter-program differences. The recent reversal of the pendelum in the "methods battle" between phonics and the whole-word approaches was initially triggered, some believe, by the public outcry in 1955 over Flesch's Why Johnny Can't Read. Chall's Learning to Read: The Great Debate (1967) forced even educators to admit the controversy was real. More recently, discrepancies have been noted between the actual data from the U.S. Office of Education Primary Reading

Studies (Bond and Dykstra, 1967), e.g., the stellar performance of the Lippincott phonic-linguistic program (Dykstra, 1968), versus the widely publicized impression that method was not found to be an important variable. Most recently, and yet to have its major impact, is the national evaluation of Project Follow-Through in which one task-analytically derived reading program (DISTAR) was so successful that poverty, high-risk, bilingual (or as some prefer, "semi-lingual") and otherwise usually very low-achieving populations taught by DISTAR read at middle-class grade-level norms by the end of third grade (Abt Associates, 1976). The Right-to-Read program may evidence recognition that method does make a difference and that the more successful methods should be implemented. As yet only lawsuits at the small claims court level (Diehl, 1975) have been successfully waged against schools for failing to teach children to read, but the day may come very soon when higher courts will entertain such cases (Stewart, 1971). The success of such cases will depend upon many factors, but proof that methods other than those used might have succeeded will be importnat (Abel, 1974; Bateman, 1975; Saretsky, 1973).

Other factors moving the learning disabilities field toward an analysis of reading and teaching methods so derived include the rapid development and acceptance of behavioral technology in improving instruction and, not unrelated, the current demand that schools become more accountable as to communicating their objectives and their actual accomplishments in teaching basic skills.

Della-Piana and Endo(1973) have reviewed three major approaches to the analysis of reading processes--the conceptual (e.g., Hively, 1966), the empirical (e.g., Holmes, 1970) and the experimental (e.g., Gibson, 1970). Treatment of these contributions and many others that could be included is outside the present discussion. We shall briefly examine several analyses of the beginning

reading process which are consistent with outcome data on reading programs, and which highlight points of particular relevance for teaching reading to children who, without superb teaching are likely to encounter undue difficulty in learning to read. Then, after a brief examination of aptitude-treatment interaction, we shall attempt to synthesize a position, with specific instructional suggestions as to how reading should be taught to learning disabled children.

Analyses of Beginning Reading

Venezky. Venezky (Note 1) has defined prereading skills. These skills are of particular importance to the learning disabled because these children are often initially identified as lacking readiness, i.e., they have not yet been effectively taught these very skills. He describes the procedure: "...[W]e arrive at prereading skills by identifying a complete set of initial reading tasks (objectives) and then defining all of the prerequisite skills for this set of tasks. Then, for a given population of pre-readers, those skills which all or almost all members of the population have mastered are eliminated" (p.5). The definition of subskills is accomplished by logical analysis of the reading task and by their demonstrated effect on later reading achievement.

His analysis of sight-word recognition skills revealed three subskills: (a) visual discrimination of letter strings, which in turn requires letter recognition (in which the only problem is orientation), attention to order of letters, and attention to the entire work; (b) association and retention of labels for the letter strings; and (c) retrieval and articulation of labels when shown the strings. His analysis of decoding revealed five subskills: (a) letter differentiation; (b) association of sound and letter; (c) blending sounds; (d) identification of a sound within a work; and (e) sound matching within words.

These subskills were studied in terms of instructional design and five emerged as the hub of the instructional program: (a) attending to letter order; (b) attending to letter orientation; (c) attending to word detail; (d) sound matching; and (e) sound blending.

In designing the experimental teaching program emphasis was placed on focusing the learner's attention on relevant features of the task, a strategy of the utmost importance and consistent with Ross' (1976) hypothesis that selective attention deficits are central in learning disabilities.

Venezky notes that many popularly emphasized skills are omitted: letter-name knowledge, fine-motor performance, visual discrimination of objects and shapes, ocular-motor control, et.al. Logical analysis reveals that these and other similar skills so commonly taught or insisted upon as a vital part of reading readiness or remediation are not part of reading (although they may be correlated with reading, as is family income). Improvement in them is not accompanied by improvement in reading and they may be demonstrated to be present and sufficiently developed for reading long before reading instruction is ordinarily attempted.

Engelmann and Bruner (DISTAR). Engelmann & Bruner (1974) take an approach vary similar to Venezky and not surprisingly reach a similar result. "We can figure out what skills should be taught before children are introduced to work reading by analyzing a simple work such as mat" (p.23, Teacher's Guide). The skills they conclude are necessary are: (a) symbol identification in which the child recognizes letters and gives correct sounds (b) sequencing, i.e., reading the symbols in the correct order (c) blending in which children are taught a word can be analyzed by sounding it out and synthesized by then saying it at normal speed, (d) rhyming so that similarities among words may be recognized.

DISTAR teaches these four skills to mastery. Symbol identification is the key decoding skill and is taught daily, beginning on the first day of the program. Sequencing is taught in the first 24 lessons, blending in the first 45, and rhyming begins on lesson 18. On lesson 37 children begin independently decoding regular words. Beginning with lesson 96 techniques for identifying words without sounding them out are begun. Story reading begins on lesson 40.

Not all children progress at the rate of one lesson a day. Teaching to mastery and not spending time on material already mastered are essential elements in DISTAR teaching. Therefore those children who need more time receive it while others may skip lessons. DISTAR Reading I emphasizes code-cracking but also includes comprehension questions, written exercises and spelling assignments. DISTAR Reading II (approximately the second year of instruction, but some children begin it during first year and others not until part way through second year) has greater emphasis on comprehension and decoding irregular words, and teaches letter names. DISTAR Reading III focuses almost entirely on comprehension--teaching children to read for new information and concepts, i.e., to read to learn.

To say DISTAR is promising for teaching reading to children who without it are at risk as potentially poor readers is grossly to understate the case.

A recent national evaluation of four year results of Project Follow-Through in five communities (Abt Associates, 1976) states that the Engelmann-Becker Direct Instruction model (DISTAR) has largely achieved the goal of raising the average achievement of economically disadvantaged children to the level of their middle-class peers. Becker and Engelmann (Note 5) report on over 8,000 economically disadvantaged children from fifteen communities (three are mostly Native American, two Mexican American, one Spanish, eight Black, three White, three

mixed Black and White). All non-poor children (approximately 2,000) in these Follow-Through sites were excluded from the analyses. By the end of third grade the poverty children were decoding one standard deviation above the national norm on the Wide Range Achievement Test (WRAT). On the Metropolitan Achievement Test (MAT) (vocabulary and reading comprehension) they were just slightly below the national norm; however this MAT performance exceeded the average of all Follow-Through sponsors by one-half a standard deviation and also exceeded that of the more advantaged non-Follow-Through comparision group. In a fifth and sixth grade follow-up covariance analysis of 600 DISTAR students, 122 comparisons were made with appropriate comparison subjects. Forty-two comparisions were significant ($p<.05$, one-tail test) and forty of those favored DISTAR. The most favorable results were in reading.

Becker, Engelmann and Thomas (1975) present data on the below 80 IQ group of Follow-Through Children ($\overline{IQ}=72$). These children gained more than a year on WRAT reading for each year in the program.

Average and above-average second graders taught by DISTAR Reading showed almost fifth grade reading achievement ($\overline{x}=4.7$ on Stanford Achievement Test at end of second grade) (Engelmann and Carnine, Note 6). Second grade Follow-Through Children who were not poor read at 4.5 grade level (WRAT) while the low-income children read at 3.7 grade level (Becker and Engelmann, Note 7).

Rozin and Gleitman. Rozin and Gleitman (in press) underscore the fact that even the most comprehensive analysis of fluent adult reading cannot lead directly to a program for teaching beginners. What must be taught to beginners is the residue after eliminating the skills the pre-literate child brings to the instructional situation and those things that will be acquired developmentally through general contact with language. They convincingly demonstrate from

research and logic, as does Venezky (Note 1), that preschool children already possess the visual perception, auditory perception, visual-auditory translation, syntactic, and semantic skills necessary for reading. What they lack and must be taught is the phonological basis of alphabetic orthography. Clinical experience with disabled readers and outcome data on both initial and remedial teaching are totally consistent with their analysis. They demonstrate a general psycholinguistic relationship: the lower the level of the language feature, the later it becomes accessible. Semantics is easier to access than syntax and syntax is easier than phonology. Within phonology, syllables are easier than phonemes. This principle, combined with historical perspective on the development of written language, leads Rozin and Gleitman to the proposition that the appropriate unit for beginning reading instruction is the syllable. The result is a reading program (Rozin & Gleitman, 1974) in which four teaching steps precede the direct teaching of single phonemes. Those first steps teach: (a) the principle that meaning can be represented visually, (b) logographic (rebus) representations, (c) words are segmentable and written symbols can represent those segments, and (d) each segment (syllable) has a unique writing and syllables recombine and blend to form new words. After these steps the children are taught that syllables can be dissected into parts and work is begun on grapheme-phoneme relationships.

They report that children have no difficulty with steps (a) and (b). Low achievers begin to have problems first at step (c) (segmenting words) and then with the memory component at step (d). Some urban children had not reached the final step of phoneme-grapheme correspondence by the end of first grade. Although some upper middle class children made the syllable to phoneme transition in as little as one month, the experimental group did not surpass controls

on phonemic skills at the end of the first year. These disappointing results may reflect program design weaknesses rather than an inappropriate analysis of reading.

Other programs. Another reading program designed from task analysis for children who may have or have had difficulty learning to read is Starter/101 (O'Keefe, 1970). "The program is essentially the product of our task analysis of the process and potential problem of learning to read... We have delineated, sequenced, and integrated hundreds of specific bbjectives" (1971, p. 55). The program consists of four-step cycles each comprised of (1) speaking and understanding words to be read in the fourth step (2) recognizing printing, producing the sound for one letter, both upper and lower cases (3) combining (blending) sounds (4) using learned letter-sounds in new words. Given a range of 22 to 55 hours of instruction, a group of 98 children who had poor school achievement and poor prognosis as to reading, averaged a seven month reading gain on the WRAT.

Glass (1971) provides a rationale, in the form of eight hypotheses, for his perceptual conditioning approach. (1) Decoding should be taught separately from "reading". (2) Meaning should be made irrelevant to decoding instruction and this can be done by teaching decoding using only words whose meaning is already known [and obviously can also be done by using nonsense] (3) Decoding must be taught without context or picture clues so that only decoding skills can be utilized. (4) Since syllabication can be accomplished only after a word has been decoded it should not be part of decoding instruction. (5) Successful decoders do not consciously use rules, so rules should not be taught. (6) Word parts (letter-clusters) are the unit to which successful decoders respond. (7) Correct visual and auditory clustering (discrimination of appro-

priate units of letters and sounds) is vital to decoding. (8) The correct mental set can be conditioned and can cause the decoder to see and respond to the appropriate letter-sound structures.

From this rationale Glass developed an instructional methodology in which whole words are individually presented and the correct mental set is induced by asking "What letters make _____ sound?" and "What sounds do the letters _____ make?" The configuration of the whole word is never changed in any way. The decoder is thus perceptually conditioned to see letter clusters which frequently appear in English. Glass argues, as do Rozin and Gleitman (in press), that it is just as easy to learn that three or four letters make a sound cluster as it is to learn one letter makes a sound. Glass recognizes that one cannot necessarily establish from the performance of fluent adult decoders that children should be taught to decode without rules, but nevertheless relies on a study by Burton and Glass (Note 8) in which it was shown that excellent readers in grades two through five also do not use rules. It should be noted that extrapolation from proficient decoders, even if elementary children, to novices may not be justified.

An interesting program to compare with Glass' is Vail's Formula Phonics (1969) which was designed for non-readers and poor readers of all ages and backgrounds. Vail (1971) says "Certainly middle and upper income Caucasian first-graders who have good attendance patterns, who are not immature, and who do not present atypical learning patterns, will probably... [read] as well, taught by conventional reading methods, as [by] Formula Phonics" (p. 111). However, Vail's concern, like ours, is for the rest of the children. Regular consonant sounds and rules and long and short vowel sounds are "programmed" into pupils as pre-reading skills, being certain that any incorrectly learned sounds are

extinguished. Then regular letter clusters (pals) are taught. Sounding words is carefully distinguished from reading. Once "programmed", students read orally from material at their highest level of comprehension. When an unknown word is encountered, the teacher then teaches the use of word-attack skills and phonic units programmed earlier by asking the class five questions (the "formula"): Does the word have (1) a suffix (2) silent letters (3) "pals" (4) any letters which must change their sounds and (5) how do you work the remaining vowels? Principles of reinforcement are systematically used. Vails "pals" and Glass' "clusters' are markedly similar, "programming" and conditioning" seem related, and total dissimilarity is seen in the treatment of rules in the two programs. Other reading teaching approaches which are consistent with task analysis and/or applied behavioral analysis include the Monterey Reading Program (Baker & Gray, 1972) which utilizes a complex behavioral analysis in monitoring child progress, and the work of Lovitt and Hurlburt (1974) and Haring and Hauck (1969). The application of known principles of learning can also be seen in the construction of certain reading materials such as the Remedial Reading Drills (Hegge, Kirk, & Kirk, 1936).

Summary. The programs briefly described in this section, have been systematically derived from analyses of reading and/or from behavioral learning principles. None has started from the premise that learning disabled children must be taught unique skills or taught in a unique way, with the possible exception of Rozin and Gleitman who use some children's observed difficulty in learning single phoneme-grapheme correspondence as a major part of the rationale for their initial focus on syllables. Like Rozin and Gleitman, Glass and Vail also use clusters of letters, both relying on observed frequency of the clusters and Glass additionally citing the performance of young, successful

decoders as grounds for the larger unit.

Programs such as those cited, most especially DISTAR, illustrate that a reading failure rate of near zero may be achieved by task-analytically derived programs which do not rely on individual diagnosis of children's psychological strengths and weaknesses. The responsibility for teaching all the essential skills in reading is assumed by task-analytically based programs and no necessary reliance is placed on extra-program training (see Engelmann, 1967b, 1969a).

Not all task-analytically derived programs nor all demonstrably successful programs were included in this brief review. These were chosen to illustrate task-analytic program derivation and to suggest that some programs are, popular mythology aside, far superior to others, in derivation and in outcome data. The same point could have been made, as it has by many others, by reporting the growing body of research (e.g., Bleismer & Yarborough, 1965; Chall, 1967; Gurren & Hughes, 1965) comparing results across programs. Fraught as the kind of research is with practical problems, it is nevertheless clear that intensive, systematic decoding programs result in better reading achievement than do other kinds of beginning reading programs. It is just possible that intensive decoding instruction is even more vital for potential low achievers than for their easy-to-teach counterparts, as teachers have long insisted (See Tobias, 1976). Is the suggestion that learning disabled children benefit more than other children from systematic decoding instruction tantamount to undue reliance on aptitude-treatment interaction? Does research justify such a suggestion? The next section explores aptitude-treatment interaction and reading instruction.

Aptitude-Treatment Interaction

Teachers have long been taught "there is no one way to teach all children --

some need one method, others need another." The often unspoken assumption is that somehow we can consistently and accurately identify those children who need technique A and those who need B. Presumably the secret of this successful matching is in some identifiable characteristics of the children.

In this section we examine the success to date of efforts to match learner aptitudes, traits, or characteristics with reading method.

Modality Instruction

An impressive list of authorities in learning disabilities have recommended that methods of reading instruction should be somehow matched go the child's relative modality patterns. Johnson and Myklebust (1967), Wepman (1964, 1971) and Lerner (1971) have all recommended teaching reading be consistent with the child's strong modality (e.g., auditory learners should be taught by phonics). Kirk (1972) has recommended direct remediation of the weakness. Rupert (Note 9) suggests initial teaching to the strengths with a switch at some unspecified time to the weakness. Othess have suggested teaching to both, concentrating on strengths in group situations and weaknesses in private tutoring; others advocate utilizing the strengths to improve the weaknesses (Johnson, 1967) and so on. (See deHirsch, Jansky & Langford, 1966 and Silver & Hagin, 1967a for slight variations.) This modality-matching advocacy has been so successful that 97% believed research supported it. Ninety-nine percent of the teachers familiar with it agreed modality should be a major consideration in devising educational preparations. The model was reported used frequently or always by 78% of the teachers.

Arter and Jenkins reviewed 15 reading studies to date (Bateman, 1967; Bruninks, 1968; Bursuk, 1971; Freer, Note 11; Harris, Note 12: Janssen, 1972; Newcomer & Goodman, 1975; Ringler & Smith, 1973; Robinson, 1972; Sabatino

& Dorfman, 1974; Sabatino, Ysseldyke, & Woolston, 1973; Smith, 1971; Tyler, 1974; Vandever & Neville, 1974; Waugh, 1973), which (a) assessed modality strengths and weaknesses, (b) designed or used materials that stress various modalities, and (c) attempted to discover modality-instructional interactions. After a careful critique of the studies, Arter and Jenkins conclude the findings are remarkably consistent in that fourteen found no interactions and only one (Bursuk, 1971) reported an interaction consistent with modality model predictions. Bursuk studied 10th graders and measured comprehension skills whereas the other 14 studies used elementary age subjects and focused on decoding outcome measures. The interaction Bursuk obtained was due to greater improvement in reading comprehension of auditory learners when they were also taught listening comprehension. Visual learners did not show a transfer from listening comprehension to reading comprehension.

Arter and Jenkins conclude, as have other reviewers (e.g., Ysseldyke, 1973; Vellutino, Steger, Moyer, Harding, & Niles, Note 13) that either the modality model is invalid or, given current limitations in educational assessment and programming techniques, it is merely not applicable at this time.

Other Interaction Investigations

Traits other than relative modality patterns have been studied in relation to different kinds of reading instruction. Among these are level of reading readiness (Stallings & Keepes, 1970, which also found a significant modality interaction and was not reviewed by Arter & Jenkins, Note 10), reading achievement (Sabaroff, 1963) and introversion-extraversion (Whitehill & Jipson, 1970). (See Berliner & Cahen, 1973 and Bracht, 1970 for reviews of ATI studies, including those just cited.) At this time few specific, definitive answers are available as to interactions between traits, other than modality strength, and beginning reading instruction. Teaching lore, if not hard data, supports

the generalization that low ability children benefit proportionately more than do high ability children from tightly structured, systematic, reading pregrams.

Reed, Rabe and Mankinen (1970) reviewed studies of teaching reading to brain-injured children, and found 42 articles written during the 1960's which dealt with educational and remedial methods for brain-damaged children. Only nine (covering seven investigations) experimentally evaluated methods; the other 33 described or recommended teaching procedures with no evidence of their merit. After analyzing the seven empirical studies the reviewers conclude "Above all, there is no empirical basis for recommending certain pedagogical procedures... for brain-injured children as opposed to non-brain injured children who also may have a learning disability" (p. 396). While these studies were not designed as aptitude-treatment interaction studies they indicate the absence of a data base for the claim that certain reading methods are better for brain-injured children.

Models for Further Aptitude-Treatment Interaction (ATI) Research

Salomom (1972) is doubtful ATI research can contribute very much to improving instruction because learners can be divided on innumerable, uncorrelated variables. But he believes ATI research can assist in developing better explanations and conceptualizations as to the nature of instruction. He proposes three models all of which relate directly to the problem of whether learning disabled children should be taught to read differently from other children.

The remedial model. The remedial model is based on a task-analytic view of teaching and can predict ATIs only when (a) task-specific capabilities account for a large part of the variance in learning outcome, (b) the material to be taught is sequentially ordered, and (c) all subordinate objectives on the hierarchy are to be learned as a result of instruction. It assumes the

learners will be changed, i.e., they will be taught to do what they cannot yet do. This model would predict, e.g., that given high and low scorers on visualization and a task which requires attending to certain details to make spatial transformations, the high visualizers would perform better under an activation treatment which merely enables them to do what they already know how to do and low visualizers would perform better under a modeling treatment which taught them the skills they lack.

The compensatory model. The compensatory model does not envision the learner will be changed; rather the deficiency in the learner will be compensated for by the treatment. If one assumes memory is unlikely to be changed by a treatment, then this model would predict that persons low in memory would perform better in a lecture treatment with quizzes interspersed every five minutes (to reduce the memory requirement) whereas those high in memory would do better in a standard lecture with note taking. If the personalogical variable can be changed, the remedial model would be preferred, according to Salomon.

The preferential model. The preferential model is useful for personalogical variables which represent general "mediating processes" across a variety of tasks and capitalizes on style of information processing, type of motivation, etc. The personalogical variables are not unlike those in the compensatory model but the logic of the matching is different. The preferential model would predict that students high on achievement motivation would perform better with achievement-oriented feedback while those high on affiliation-motivation would do better with affiliation-oriented feedback. The unsuccessful modality-reading instruction matching studies reviewed earlier may have been conceptualized as efforts to employ this model, although arguably some investigators may have viewed their work as fitting the compensatory model.

Salomon's review of studies leads him to conclude that (a) when treatments provide the mediators which low performers cannot (do not) provide for themselves, that treatment will depress the performance of those who do provide the mediators themselves, and (b) when treatments capitalize on stronger aptitudes, the high scorers benefit more.

Summary and Implications

The failure of modality matched reading instruction to show the expected aptitude-treatment interactions need not yet preclude further investigation of other traits in relation to instruction. If learning disabled children do suffer, as Ross (1976) suggests, from selective attention deficits, Salomon would predict they would benefit, where other children would not, from reading instructions which either compensates for that deficit or teaches selective attention directly. In the following section we propose reading instruction for learning diaabled children which does just that and does so within the confines of intensive, direct decoding instruction derived from a task-analysis of reading.

The Fourth Approach

Much remains unknown about the reading processes, learning disabled children, and reading programs. And yet enough is known, if only it can be implemented, to greatly reduce if not totally eradicate the severe reading problems now so rampant in American schools. What follows is one observer's perspective as to that which is known and bears directly on how reading should be taught to learning disabled children. Some observations seem to be self-evident; some are inferences and extrapolations from empirical data; and some may be just plain errors. Taken together they say:

Learning disabled children are those who must be taught by the best read-

ing methods available if they are to succeed. So taught, they can and do learn to read. Therefore, "teaching disabilities" is a more precise term than learning disabilities to describe the cause of their failure when it does occur. Near failure-proof methods for teaching all children to read are already available. Continued failure of schools to employ these programs is at best negligent and at worse malicious. Implementation of the best that is currently available would help mightily; further refinements in these programs would help slightly more.

Beginning Reading Processes

The first step in beginning reading is converting written symbols to their spoken equivalents. This may be done, theoretically, using any unit from paragraphs to single graphemes. Conventional beginning reading programs of the last forty years have used the word as the initial unit to be converted. Both data and logic suggest better reading achievement accrues from using smaller units. The word approach has been defended by inappropriate extrapolation from questionable analyses of proficient adult reading and by claims it provides easy access to meaning in order to maintain children's interest. (But how interesting are Dick and Jane's "ohs" and "looks" and how reinforcing is memorizing whole words versus "figuring out" new words (Blumenfeld, 1974; Johnson, 1970)? Regardless of the merits of the whole word or meaning emphasis approach for the majority of children who do seem to learn to read by "osmosis" and without intensive, systematic or structural instruction, the clear fact is this method has been disastrous for learning disabled children. Systematic decoding must be the first step in reading and must be the direct focus of initial instruction for all learning disabled children. Further, it must be recognized that decoding, not comprehension, is the potential pitfall for learning disabled children.

Task analysis of decoding reveals it contains certain subskills: (a) responding to graphemes or grapheme clusters with appropriate phonemes or phoneme clusters; (b) responding in the appropriate temporal sequence, derived from the spatial order of the written symbols; (c) blending the phonemes or phoneme clusters into words. Adequate sound-symbol association learning allows the inference that its subskill of letter discrimination was performed and that discrimination in turn allows the inference the child's attention was selectively and appropriately focused on relevant stimulus dimensions.

Two skills are conspicuously absent from a task analysis of decoding: (a) letter naming and (b) picture and/or "context" reading.

Letter naming. Correlations between knowledge of letter names (number known) at the beginning of first grade and reading level at the end of first grade have been reported by Bond and Dykstra (1967) to range between .51 and .60. However, in a well designed study, Speer and Lamb (1976) have shown that fluency (rate) of letter naming correlated .79 to .85 with reading achievement. Since it is logically evident and empirically established (Samuels, 1971) that letter names do not per se facilitate reading, the fluency factor emerges even more pertinently. Speer and Lamb predictably found no relationship between gain scores in letter naming and reading achievement. Rate of accurate decoding is probably a more important factor in early reading proficiency that has been recognized in the past (Starlin, 1971). Unfortunately the very children for whom the initial associative learning of sound-symbol relationship is difficult are the same children who obtain less practice and whose fluency is thus doubly hindered.

Picture and "context" reading. Pictures may be used to teach the concept that symbols on paper can signal us to say something. Programs which utilize

rebus writing do just that (e.g., Rozin & Gleitman, 1974; Woodcock & Clark, 1969). Many children do need systematic instruction in the concept that speech can be depicted in written form. However, there is no clear evidence that the concept is too difficult to teach using words and letters.

Only if a learning disabled child does not acquire the concept in spite of clean teaching using graphemes or words (a most unlikely event) would it seem appropriate to use pictures. Since learning disabled children, by definition, have more than their share of difficulty in reading, it is foolish to teach unnecessary, extra steps.

The other use of pictures in beginning reading programs is as an aid to comprehension and therefore an "interest-maintainer." The merit of this must be weighed against the fact that humans seem to walk the paths of least effort. Pictures often enable the child to falsely appear to be decoding. Fluent, automatic decoding is a prerequisite to later wholistic comprehension, (Laberge & Samuels, 1974) and pictures can, for some learning disabled children, significantly distract the child's attention and energy from the essential task of decoding. The argument that decoding and comprehension initially utilize different cognitive processes and perhaps even different areas of the brain can be made, but for present purposes, the need for attention to be focussed on decoding is a sufficiently strong argument to urge that pictures not be employed as a comprehension aid.

A related contention is that pictures are motivating or reinforcing. This is probably true and therefore they should be used <u>after</u> successful decoding to provide informational closure and feedback (Gibson, 1970) or whatever other type of reinforcement they can. At least one program (DISTAR) uses pictures this way.

this way.

Other context clues are often urged upon children and inevitably lead the child to adopt guessing as a decoding tactic. Proficient adult readers do form hypotheses and expectations about what the next ideas will be - that is not disputed. Out contention is that accurate decoding skills must be acquired before that stage and that guessing strategies interfere, for learning disabled children, with accurate decoding.

Learning Disabled Children

If learning disabled children differ, as a group, from other children in ways relevant to teaching reading, these differences might be described as need for (a) systematic aid in attending to the relevant features (shape and position) of the graphemes to be discriminated (Ross, 1976) (b) greater than usual number of repetitions of correct grapheme-phoneme association and (c) more systematic reinforcement of new learning. (for closely related observations on unfamiliar learning see Engelmann, Note 14)

As indicated earlier, special education efforts to find aptitude-treatment interactions have focused on modality aptitudes and been notably unsuccessful. Literature from other disciplines (e.g., Berliner & Cohen, 1973; Cronbach & Snow, 1969) is not as pessimistic. It is too early to dismiss the possibility that some techniques of reading instruction are particularly beneficial for some children. Learning disabled children, as currently labelled, are not a homogenous group. But to the extent characteristics are shared these may constitute appropriate personalogical variables for interactional investigation. The hypothesized lower performance on selective attention to graphemic features and more trials to mastery are characteristics which would be changed through successful intervention and therefore Salomon's (1972) remedial ATI model would

be appropriate. The model would predict, we believe accurately, that treatments including direct teaching of selective attention and providing numerous repetitions would deter the performance of those non-learning disabled children who already discriminate symbols and need few repetitions. ATI literature seems to suggest the principle that the further away a learner is from mastery of an objective the more the learner benefits from structured, deductive, rulee approaches and conversely, the less yet to be learned, the greater the benefit from egrule or inductive or inductive approach (Tobias, 1976). This principle is related to the oft heard generalization that academically able youngsters can learn to read with any approach while difficult-to-teach children need a "structured, phonics" program.

It has not been definitively established that all or even most learning disabled children have these particular deficits. A reasonable interpretation of available data suggest they might. To the extent they do, ATI models should be employed more carefully than in the past in an effort to successfully match these learning characteristics with suirable structured teaching techniques.

Attending to relevant phoneme features. Learning disabled children should be taught the rule that "letters and numbers point one way." Everything a child has learned about spatial orientation prior to encountering letters and numbers has been that what something is called is not affected by rotation and that one need not therefore attend to how it is "pointed" when naming it. It is hard to know whether to laugh or cry when "severe strephosymbolia" in a ten-year old boy is instantly cured by teaching the "Pointy Rule." It is even harder to answer his somber "Why didn't any of my teachers tell me that?" Admittedly, and remarkably, most children figure out the Pointy Rule even though they do not articulate it. They are masters of incidental learning;

learning disabled children are not.

Learning disabled children need practice, to mastery, in discriminating all letters from each other, e.g., b from d. As yet unresolved, but readily determinable, is whether children who required more practice reach mastery more readily by overlearning b before d is introduced or by initial confrontation with the pair. In either case, learning is made initially easier if other discriminable features (e.g. type style) are added to spatial orientation. Hyman and Cohen (1975) have shown that decreasing the stimulus intensity of the vertical line aids in this discrimination. In short, reversal problems and other letter discrimination failures can be prevented by good pedagogy - even if they do have their origin in "minimal brain dysfunction," in the genes, or in a weak ego.

Greater repetitions to associative mastery. Precise data are difficult to locate, but clinical lore suggests; probably quite accurately, that some learning disabled children require as many as 1500 to 5000 correct associations of initial sound-symbol correspondences before reliable retention will occur. After the first few symbols are learned (i.e. the correct sound response invariably given to the letter stimulus) the number of required repetitions drops markedly and will approximate that of non-learning disabled children. It is difficult to determine, in ordinary teaching situations, whether the repetitions are required because of difficulties in selectively attending, discriminating, or associating. The teacher should therefor cover all bets by special care as to each possibility. Commonly, teachers find it difficult to provide sufficient monitored oral response opportunities to the first symbols before more are introduced. The child's confusion mounts and uncorrected errors proliferate, further compounding the failure cycle. Teachers must be especially alert ot the pitfalls of pro-

viding off-target practice. Circling a thousand worksheet pictures of things that start with /m/ provides exactly zero practice in looking at m and responding with /m/. It is only the latter skill that is part of decoding. The clear implication is that teachers must somehow provide sufficient and appropriate repetitions and must monitor progress very precisely. This is a tall order, but less is not teaching and is not defensible. Letter names double the child's learning burden and do not contribute to reading skill. Therefore, they should be taught only after decoding skills are fairly solid (as done in DISTAR).

The use of reinforcement. Children can be taught to read even though we have not resolved the complex and fascinating disputes between behaviorists and those of other persuasions as to the nature of the acquisition of language skills. But some learning disabled children will not be taught to read without careful use of well established behavioral principles of reinforcement. The complexities of reinforcement schedules and the technicalities of differences between negative reinforcers and punishers need not be mastered by all teachers. But we do need to recognize that mastering decoding skills is not sufficiently "intrinsically" rewarding to all children to maintain the necessary effort. We might ardently wish it were or even believe it "should" be. Neither changes the fact that it is not. Reading programs should have built-in procedures for appropriate reinforcement and for visibility and precise monitoring of children's presentation of reinforcement and recording is outside this discussion, and the interested reader will find ample assistance in a variety of sources such as Burdett and Fox (1973), Haughton (1972), Lovitt (1973), and Starlin (1971) for recording techniques and O'Leary and O'Leary (1972) and Becker, Engelmann, and Thomas (1971) for reinforcement and management techniques useful in class-

room reading instruction.

Teacher Training

At the present time the single obstacle to successful reading instruction for learning disabled children is inadequate teacher training programs in the nation's colleges of education. Learning disabled children can learn and reading programs adequate to teach them, in the hands of well-trained teachers, are already available. Those who would improve the abysmal state of reading instruction for learning disabled children have a two-fold job -- first persuading the education world it is currently possible and then teaching that world the skills required to do it. The persuasion burden may be the heavier. Research has not been a potent aid; litigation may be (Abel, 1974; Bateman, 1975; Saretsky, 1973; Sugarman, 1974).

Summary

Like other children, learning disabled children bring to school adequate auditory, visual, auditory-visual integrative, syntactic, and semantic skills to learn to read. Like other children, they do not need to learn letter names or picture reading to decode. Like other children, they do need to be taught the separate, or at least separable skills of decoding sound-symbol correspondence, left-to-right sequence, and sound blending.

Perhaps unlike other children they need programs and teachers which especially emphasize selective attention to relevant grapheme features, provide and require adequate repetitions of grapheme-phoneme correspondences to insure mastery, and systematically utilize principles of reinforcement.

And, finally, all our children need accountable schools committed to teaching them to read even if that committment requires, as it does, the relinquishment of handy-dandy cop-outs and the acceptance of demonstrably effective reading programs and teaching techniques.

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OPEN DISCUSSION OF BATEMAN PRESENTATION

SHUY: When you were talking about the second of your last three points, the greater repetition to associative mastery, you said we needed more monitoring of these repetitions. Could you explain who does the monitoring? Do you mean the teacher monitors, or the child monitors himself, or how is that?

BATEMAN: Both. Well, self-monitoring at the very early stages would be kind of tricky, because it's basically an oral response, it's the same as that /m/ that needs to be monitored, and it is making sure that the youngster is looking at the stimulus, m. The abuse that I am concerned about is the kind that occurs when the teacher gives a flash card with an m to another child and says, "Have Janie whip through 50 repetitions." Obviously, Janie can sit there and say /m, m, m/ without performing the task at all.

During the last couple of months, I have been working with teachers in developing ways to get in more and more repetitions and to monitor those repetitions to make sure that the child is really looking at the stimulus at the time and that the response is the appropriate one. We have gotten real live second- through about sixth-grade teachers, who can comfortably get in 500 monitored repetitions a day.

Thank goodness, there is reason to think that after the first few sounds have been really learned to mastery--after up to, say, 5,000 repetitions--the curve of number required drops off very quickly. There is also reason to think that kids will quickly--by which I mean, give or take around the seventh to fifteenth symbol--not require more repetitions than do other kids. Thank goodness. Teachers would be going out of their trees otherwise.

SHUY: Could you tell me what research you based this on?

BATEMAN: No. I said it is very flimsy. I have an impression that either Margaret Rawson or someone I associate with Margaret Rawson in the Orton Society in New England has some data, which, I believe, were published in the Orton Society's Bulletin.

Sig Engelmann has some; I can refer you to an unpublished paper of his, and I have some clinical data not published. I think that 5,000 is probably a top number. Sig says 1,500 is going to get 99.99% of the kids.

GOODMAN: Okay. These programs that you listed--Dick Venezky's, Distar, Formula Phonics, the Glass Analysis method, and several others--from my point of view seem to differ sharply in the linguistic or scientific validity of the information that they are based on. They range from impressionist, old-fashioned phonics to Dick's, which I would describe as tightly based on linguistic information. But you put them all together. Am I right to conclude, then, that it doesn't matter how scientific the phonic content is, as long as it has the characteristics that you describe?

BATEMAN: I wouldn't conclude that, but I wouldn't argue with your right to, if you chose. I think it probably matters a great deal.

I didn't screen these programs on the basis of guaranteed success or even on the basis of more success than conventional methods. I did have those kinds of data on Distar, and I suspect that those kinds of data could be obtained on all of these programs. But I will not swear to it.

I chose them because either they had data going for them, or they purported to be derived from task analysis. My guess would be, if you had programs derived logically from task analysis, and some of them had paid much more attention to--whatever your term was, linguistic science--

GOODMAN: Let's call it linguistic validity.

BATEMAN: I don't know whether what you call linguistic validity would or would not relate to outcome data, but I would be willing to say that there certainly are some kinds of input features that would relate to outcome data. I just don't know whether what you mean by linguistic validity is one of them or not.

GOODMAN: I guess the question I am asking is: if you are making the key thing that you use a task analysis to decide what to teach, and then you teach it, even if, it takes 5,000 times, is it possible that some of the things you are teaching are wrong or nonproductive?

BATEMAN: As I indicated before, I think educators have a tremendous tendency in practice in the real world to add clutter to the teaching of just about everything.

GOODMAN: I am not talking about clutter; I am talking about things which are simply based on erroneous analysis of the tasks, on not using the linguistic data available, for instance. I think even a cursory examination of Vail's Formula Phonics shows it doesn't have a scientific basis.

BATEMAN: I don't intend to argue that it is scientifically based. I am saying

that Vail purports to have derived task analysis, I am using the term, and although I cited none of his data, I get them over my desk regularly. But I have not examined them carefully enough to know whether they even meet the criteria for good outcome data. I do know, however, that the fact that he makes them so freely available suggests that at least he believes the outcome data compare very favorably with those of most conventional reading programs.

But if you are saying that task analysis isn't enough, and that if you have good task analytic programs, then differences within them might reasonably be expected to accrue, as a result of care with input, I would certainly agree with that all the way.

I think from an educator's viewpoint, however, it is more important to focus on the fact that we have these programs, imperfect, unscientific as they may be, which seem to perform better than conventional programs. Now, maybe these programs don't perform as well as we would like them to, but let us first get rid of the lousy programs that flourish and then start refining the ones that come close to our ideals. There is a good deal of room for improvement in every program I have seen.

CHALL: Are you saying, Ken, that the step that takes 1,500 times to learn might be avoided altogether by skipping the stage in which that step occurs?

GOODMAN: I guess I am suggesting that maybe the kid is trying to tell you something by taking that long to learn something which is supposed to be intrinsic to the task. If there is a kid alive who can resist over 5,000 rehearsals learning something, there must be some reason why he is resisting.

BATEMAN: He gets those in speech. He gets more than that in speech. He gets a lot more than that in speech.

It seems to me that you just said that the kids are trying to tell us something. I agree. But I guess I start from the value judgment that the ability to determine, efficiently and rapidly, what it is that the author of the printed word has said is a skill worth having. I start with that premise. And I believe that until youngsters can accurately determine what it is that has been said, the quality of their interaction with what was said, their evaluation of it, and their response to it is kind of limited. So I started out wanting to teach kids to be able to read anything and everything in this whole wide world.

I admit that that's a value judgment. I observe that in our country, kids' ability to understand what they read seems to have been declining from a point that, maybe, never was as high as it could have been, and I observed that some programs seemed to do a much better job of helping kids to be able to read what's around them.

GOODMAN: I can't understand how it could be irrelevant to care whether the information in the Venezky program is more scientific or better based or constitutes a more defensible analysis of the task, than the Glass Analysis program or the Distar program.

BATEMAN: I didn't mean to say it was irrelevant.

GOODMAN: Then, isn't it possible that the method could produce things which are actually counterproductive, damaging to children? You are going to teach it to them until they learn, whether it's good for them or bad for them. Once you have

decided, the child has no escape.

BATEMAN: Ken, if I said that it was irrelevant, I mispoke, I did not mean that.

Also, my point about increased opportunities for monitored association to mastery was suggested as a modification of existing programs, in cases where kids require more modifications. I do not wish to convey that any of the programs require 5,000 symbols.

SINGER: Instead of calling it kid disability, you are going to call it something else, teaching disability. What is your criterion for teaching disability?

BATEMAN: Oh. I have never sat down and written a tight definition, which I could be sure included everything I wanted in the concept. But one of the important criteria would be that if it is demonstrated that when different instructional arrangements were used, the kid in fact did learn. I would say the deficiency, because the youngster did learn it Wednesday, shows that whatever difference or deficiency was in the child on Monday, was irrelevant to instruction, and that by rearranging the teaching to me implies that what happened before was unsuccessful teaching.

SINGER: Okay. Now, the next question is: How many trials do you run before you decide that you ought to change the teaching arrangement?

BATEMAN: That depends on the evaluation system that you are using. I will stick with that as the general answer and cite two different kinds of particulars.

If you are using criterion reference testing, as in a program like Distar, then that decision is made for all kids, across all lessons. I think it's an average of once every 2 or 3 days, but I wouldn't swear to that. It's at least twice a week. So in that sort of criterion reference, continuous mastery testing would go like that. On the other hand, if you were using an evaluation technique like precision teaching, as the people who use that technique swear their data show, you can make reliable decisions to change on no more than ten data points. Furthermore, others, Owen White, for example, have techniques for doing it at seven data points, and ordinarily in the real world that would represent seven instructional days.

I would say that you never wait more than ten days, no matter what kind of instructional program you are using. And I would hope we would continually be able to make those decisions quicker and quicker and quicker. And in the real world of 27.2 children, maybe, some day we could at least make such decisions daily for all of the kids for whom this kind of rigor is important.

I would also add that, for 80% of the kids, it doesn't seem to matter that much how sloppy we are in our teaching. Our concern is with the kids who are going to bomb out if we don't spruce up. And that's not nearly all of the children.

GLASER: Some of your suggestions for beefing up good programs to help these children are clear. For example, practice certainly needs to be reinforced, and it is often just practice without all of those other things, or nonpractice. But in your concern for selective attention, what kinds of things did you have in mind? Did you mean making the relevant features more obvious, or are you thinking of some more internalized attention focusing?

BATEMAN: One of the things I wish somebody would build for teaching, particularly for teaching this symbol-sound correspondence, would be some kind of a little machine that, when you are teaching "m," would make everything about it except the shape and spatial orientation vary. You could punch a button, and make it turn different colors. Punch another button, and it becomes all different sizes. I would like to have some very efficient way to vary everything else, so that a child would get the idea.

The kids who are in a traditional sight vocabulary kind of program develop the concept that "mother" is the one that's got the torn corner, and that gets them through the first grade. I really want to prevent that. So varying size, shape, that's one kind of thing. There are other kinds of things.

STICHT: When you talked about the aptitude treatment interaction and the task analysis approach, you seemed to imply that a diagnostic kind of approach wasn't effective and that you want to go to task analysis; yet when you also talk about aptitude treatment, that implies aptitude. So it seems as though you have made some evaluation of the person. And then you have some task. Can you, then, have a branching program, or is all of your aptitude treatment going to be on the basis of practice with one program?

I didn't quite see how you could not understand where the person is vis-a-vis the task you wanted him to do, and if you do understand where he is at, so to speak, isn't that diagnostic?

BATEMAN: Okay. The modality matching form of ATI was a big chunk of sand on which the diagnostic remedial method rested for some years. What I meant to say was that, in the process of rejecting the Frostig and the ITPA, some of us also

rejected ATI.

My current thinking is that maybe many of us who are special educators, who walked over to the task-analytic camp, leaving all of ATI behind us, found nothing that looked like ATI.

Ross and the others are suggesting maybe the kids are different in terms of attention. Salomon's model suggests that if you build in the very things that I was talking about--these excessive repetitions for kids who don't need them--you will actually get a detriment in performance; if you got that detriment, you would have an ATI, and I really think Salomon is right.

Another thing which I didn't really get into in this presentation at all, is that I think the ATI literatue suggests a generalization like this: The further away the learner is from the objective, the more important structure is in the teaching methodology, and the closer the learner is to achieving proficiency, the more one can loosen up and be inductive, or use discovery, without in any way impairing performance.

GLASER: I want to point out that the ATI business has a historical tradition which doomed it to failure at the beginning and forced people into task analysis. The reason for this is that aptitudes came from the psychometric tradition, and the treatments came out of learning, and they never related much to each other. When people discovered that they weren't getting anywhere, they decided that, maybe, the thing to do was to discover what the learning task and aptitude performance had in common, so they would have common dimensions on which to relate the precursor behavior (aptitude) and the treatment.

ROSNER: I would like to agree with both of you on this on the basis of some of

the work on the project I was involved in during the last few years. We found that, in determining how sensitive kids were to the phonological attributes of spoken language, how comfortably they could segment words into phonemes, would appear to suggest an instructional procedure. It appears that the closer they were, or the better they were at phonological segmentation, the less precise the instructional method for teaching reading had really to be, and more of an inductive process could be brought to bear. So what it appears to be is an ordinal interaction, not a dis-ordinal.

FREDERIKSEN: I think there is one other reason why the ATI failed, and that had to do with the assessment side of it, the use of global measures of aptitude. I think that the notion of fitting a task to a person was correct. But it has to be based on a much more micro-level description of a person, perhaps not in terms of test scores, but in terms of process model. Also, it requires a micro description of the task, the task analysis.

I say this because I made an excursion into aptitude treatment interaction in my Ph.D. thesis, where I looked at a very minor microscopic level of ability, at a microscopic level of performance and found very massive effects. I know most of the research isn't done that way in the ATI tradition. It's done in a very global way, in terms of both the person and the task.

BATEMAN: Salomon has pointed out--and I think this has great implications--that the predictions that you make as to ATI should vary, depending on whether you expect the learner to be changed or the instruction to compensate. This is where we get in the teaching disability conceptualization versus learning disability conceptualization, which would require us to make different predictions as to some of our ATI's. I am hoping this would be another area more people would get

into, in regard to these kids.

PRESENTATION BY JAMES HOLLAND

RESNICK: The next paper, which is by Jim Holland is entitled "The Analysis of Behavior in the Reading Instruction." It is not, like last night's analysis of programs, an analysis of a couple of specific instances, but, rather, as Jim will explain, a look at some general principles of instructional designs, and how they might be applied, or are applied, or are not applied in the case of reading.